MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS
2013/2014 ACADEMIC YEAR

FOUTH YEAR FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 453   **COURSE TITLE: APPLIED HYDROLOGY**
TIME: 3 HOURS

INSTRUCTIONS
1. Answer the TWO questions in Section A
2. Attempt any THREE questions in Section B

SECTION A   40 MARKS

1. (a) Define the Unit hydrograph of duration D   [3 marks]
   (b) On a catchment of 30 km^2, after a 2 hour storm, the time and discharge of a river is given below. Determine as accurately as possible the peak flow and the time of occurrence in a flood exerted by a 6hr storm which produces 1.65cm runoff during the first 2hrs and 3.5cm of runoff during the second 4hrs from the unit hydrograph of the 2hour storm in catchment of area 30 km^2 above.   [12marks]

Time	0	2	4	6	8	10	12	14	16	18	20
Discharge m^3/ sec	3.5	3	6	13	17	20	19	15	10	7	5

2.0 (a) Briefly describe four main factors affecting runoff amount from a basin   [6marks]
   (b) The data pertaining to stream-gauging operation at gauging site are given below. The rating Equation of the current metre is V = 0.435 N + 0.015 m/s. Calculate the discharge in the stream   [19 Marks]

Distance from the left Water edge (m)	0	3	6	9	12	15	18	21	24
Depth (m)	0	1.1	2.0	2.5	3.0	2.4	1.7	1.0	0
Revolutions of a Current metre kept at 0.2 depth	0	57	74	140	160	120	90	60	0
Revolutions of a Current metre kept at 0.6 depth	0	45	66	125	145	111	78	48	0
Revolutions of a Current metre kept at 0.8 depth	0	39	58	100	130	95	66	45	0
Duration of Observation (s)	0	145	140	140	148	145	145	147	0

3.0 (a) Distinguish between Hydrologic routing and hydraulic routing [3 Marks]

(b) Using Muskingum method for flood routing, determine the following hydrograph through a river reach for which K=7.0h and x = 0.12. Assume that at the start of the inflow flood, the outflow is 7m^3/s. [7 Marks]

Time (hrs)	0	2	4	6	8	10	12	14	16	18	20	22	24
Inflow m^3/s	7.5	15	25	35	42	60	75	80	70	40	35	20	10

4.0 (a) Differentiate between Risk and Safety factor for parameter M as used in hydrologic design [3 marks]

(b) Diferentiate between Hydrological design level and Hydrological design Scale [3 marks]

(c) A 30 –year annual flood data was analysed by an Engineer in order to design a flood-mitigation project of an area of about 150km^2. The data analysis yielded the following results: Arithmetic average of all floods in the series $\overline{X} = 90.5 \, \text{m}^3/\text{s}$, and the standard deviation of the same series s = 45.0. Calculate the 90-year flood using Gumbel's equation. [4 Marks]

5.0 Briefly describe ten structural measures for flood control [10 Marks]

6.0 (a) Differentiate betweent Piezometric surface and Hydraulic head as used in Groundwater studies [3 marks]

(b) The piezometric surface of a confined aquifer is 2.5m below the water table of an overlying unconfined aquifer. The two aquifers are separated by an aquitard of 1.5m thickness. The water table in the unconfined aquifer is 30 m above the top of the aquitard and is in equilibrium with the downward flow due to infiltration from above. Hydraulic conductivity of the unconfined aquifer is 0.65 m/day and for the aquitard is 0.25 m/day. What is the flow rate from the unconfined to the confined aquifer through the aquitard? [7 marks]